# Mount Lyell Abt Railway Tasmania

## Nomination for
## Engineers Australia Engineering Heritage Recognition

## Volume 1

**Prepared by**
**Ian Cooper FIEAust CPEng (Retired)**

**For**

**Abt Railway Ministerial Corporation &**
**Engineering Heritage Tasmania**

**July 2015**

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# HERITAGE AWARD NOMINATION FORM

The Administrator
Engineering Heritage Australia
Engineers Australia
Engineering House
11 National Circuit
BARTON ACT 2600

Name of work: MOUNT LYELL ABT RAILWAY, TASMANIA

This work is nominated for an award under the Heritage Recognition Program of Engineers Australia.

Location: The Abt Railway runs over 34.5kms from Queenstown ($42^0 04' 46'' S$, $145^0 33' 15'' E$) to Regatta Point, Strahan (42004''37''S, 145019''38''E) on Tasmania's West Coast.

Owner: The Abt Railway Ministerial Corporation
22 Elizabeth Street
Hobart TAS 7000

The owner has been advised and the letter of agreement is attached.

Access to site: The site can be accessed at the Railway Station in Queenstown or the Railway Station at Regatta Point, Strahan.

Nominating Body: Ian Cooper FIEAust CPEng (rtd)
on behalf of the Abt Railway Ministerial Corporation
(see attached letter of approval)

*Bruce Cole*

……
Chair of Engineering Heritage Tasmania
Date: 12 July 2015

# BASIC DATA FORM

**Item Name:** MOUNT LYELL ABT RAILWAY, TASMANIA

**Other Names:** Abt Railway; West Coast Wilderness Railway (since 2003)

**Location:** The Abt Railway runs over 34.5kms from Queenstown ($42^0 04' 46'' S$, $145^0 33' 15'' E$) to Regatta Point, Strahan (42004'37''S, 145019'38''E) on Tasmania's West Coast.

**Local Govt. Area:** West Coast Municipality

**Owner:** The Abt Railway Ministerial Corporation
22 Elizabeth Street
Hobart TAS 7000

**Current Use:** Tourist Heritage Railway between Queenstown and Strahan; freight operation between Strahan and Teepookana transporting Huon pine timbers and Leatherwood honey from the Teepookana Plateau.

**Former Use:** Transportation of copper concentrates but also freight and passengers services between Queenstown.

**Designer:** Mt Lyell Mining & Railway Company P/L

**Maker/Builder:** Mt Lyell Mining & Railway Company P/L

**Year Started:** 1893 **Year completed:** 1899 **Year restored:** 2002

**Physical Description:** The narrow gauge (1067mm) Railway operates between Queenstown and Regatta Point with a 7km section of twin blade rack rail from Hall's Creek to Dubbil Barril. There are 39 bridges; the majority of steel trestles, 4 timber trestle replica bridges, 2 Bailey Bridge structures, a restored steel girder bridge (ex Strahan to Zeehan Railway) and the only original steel Pratt truss Iron Bridge. The train is hauled using one of the three restored Abt locomotives or Drewry diesel locomotives. Replica carriages transport passengers.

**Physical Condition:** The Railway has been restored and is fully operational.

**Modification & Dates:** The original railway ceased operation in 1963 but was restored over a period of 3 years and became fully operational at the end of 2002. After a 9 month period for major overhaul of the rail infrastructure in 2013, the Railway is now operating over the full length as a tourist heritage railway.

**Historical Notes:** 1893 (March-July)-survey of possible railway routes;
late 1893-construction of the first stage from Teepookana on the King River to Queenstown and completed in 19 months;
1898 (Dec)-construction of the second stage from Regatta Point to Teepookana including the launching of Iron Bridge and completed 10 months later;
1963-operation of the Railway ceased;
1999-planning and design of the restoration as a heritage tourist railway;
2000(Feb)-construction commenced and completed towards the end of 2002;
2002 (Dec)-rail safety accreditation approved and West Coast Wilderness Railway became fully operational.

**Heritage Listings:**

**Name:**

**Title:**

**Number:**

**Date:**

# ACCEPTANCE FROM OWNER

52-12

Hon David O'Byrne MP
**Minister for Economic Development**
**Minister for Science, Innovation and Technology**
**Minister for Infrastructure**
**Minister for Police and Emergency Management**
**Minister for Workplace Relations**

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Tasmanian Government

07 AUG 2013

Mr Bruce Cole
Chair
Engineering Heritage Tasmania
Institution of Engineers Australia
Royal Engineers Building
2 Davey St
HOBART TAS 7000

Dear Mr Cole

Thank you for your correspondence of 15 July 2013 concerning the nomination of the Abt Railway for an engineering heritage award.

On behalf of the Abt Railway Ministerial Corporation (ARMC) I give my permission for Engineering Heritage Tasmania to proceed with the nomination.

I also agree to provide some funding for an interpretation panel onsite in Queenstown. However, it is not yet clear what funds the ARMC may have available for this purpose.

A representative from the Department of Infrastructure Energy & Resources (DIER), Dr Martin Blake, will be able to assist you with any further enquiries and can be contacted via telephone on (03) 3233 7836.

I wish you every success with your nomination.

Yours sincerely

David O'Byrne MP
**Minister for Infrastructure**

# INTRODUCTION

The Mt Lyell Abt Railway, now operating as the West Coast Wilderness Railway, is located in Tasmania's rugged but picturesque West Coast, running from the early mining town of Queenstown to Regatta Point, Strahan on the northern banks of Macquarie Harbour, a distance of 34.5 kilometres. Queenstown is a four hour drive from Hobart to the east of the State and a similar time from Devonport to the north. It is a further 40 minutes to the town of Strahan.

The Mt Lyell Mining & Railway Company commenced operations in 1892 and the only effective means of transportation of its copper ore from the mine in Queenstown was a railway to the ports of Teepookana on the King River and later Strahan.

With the growth of mining operations on the West Coast in the 1890s, other Government and private railways (refer Figure1) were needed not only for transport of ore but also for much needed equipment, materials, and basic necessities for workers and their families. It was not until 1932 that road transport became available between Hobart to Queenstown, significantly improving the communication with the outside world.

The Mt Lyell Railway operated for 67 years, ceasing operation in April 1963 when road transport to the north became a more economic option following the opening of the Murchison Highway from Rosebery to the North West Coast. The Mt Lyell Company was also facing significant costs with its ailing railway infrastructure, particularly that of needed bridge replacement.

Strong local pressure followed for the Railway to be restored as a heritage tourist railway with the main features of the mining history, rugged wilderness scenery and the unique Abt rack and pinion system. In 1998, the Australian Government contributed $20.45 million from the Centenary of Federation Fund for the restoration of the Railway, with further funding supplied by the State Government and the private sector. The environmental and technically challenging planning, design and construction work began in early 1999 with train services commencing in early 2003.

The lessee and operator, West Coast Wilderness Railway, ran the railway for 10 years, making significant improvements to the track and locomotive operational efficiencies but, in citing economic difficulties, ceased operation on 30 April 2013. After a short break in service, the now Government-operated railway began a return passenger service from Queenstown to Dubbil Barril in January 2014, with services over the full 34.5kms from Queenstown to Regatta Point from 15 December 2014.

At the time of preparation of this submission, the Government was still in negotiations with potential private sector operators.

This Engineering Heritage submission focuses on four aspects of the Mt Lyell Railway engineering heritage significance; the Abt rack and pinion system, the survey and construction of the Railway, the unique Abt locomotives and the assembly and installation of the Pratt truss structure that spans the King River that became known as 'Iron Bridge'.

## Engineering Australia Awards for the Railway restoration project

In 2001, the Tasmania's Abt Wilderness Railway was awarded The Institution of Engineers Australia, Tasmania Division Engineering Excellence Award for the planning, design and construction of the restoration project. This Award gave recognition to Sinclair Knight Merz Pty Ltd, State Government of Tasmania, Hazell Bros Civil Contracting Pty Ltd, Honeybank and Saunders & Ward Pty Ltd. Later in the same year the State Government of Tasmania went on to win the Institution of Engineers Australia Australian Engineering Excellence Award.

In 2005, West Coast Wilderness Railway won the inaugural Engineering Heritage Colin Crisp Award in recognition of the restoration as "a major engineering project with clear attention to heritage and the environment".

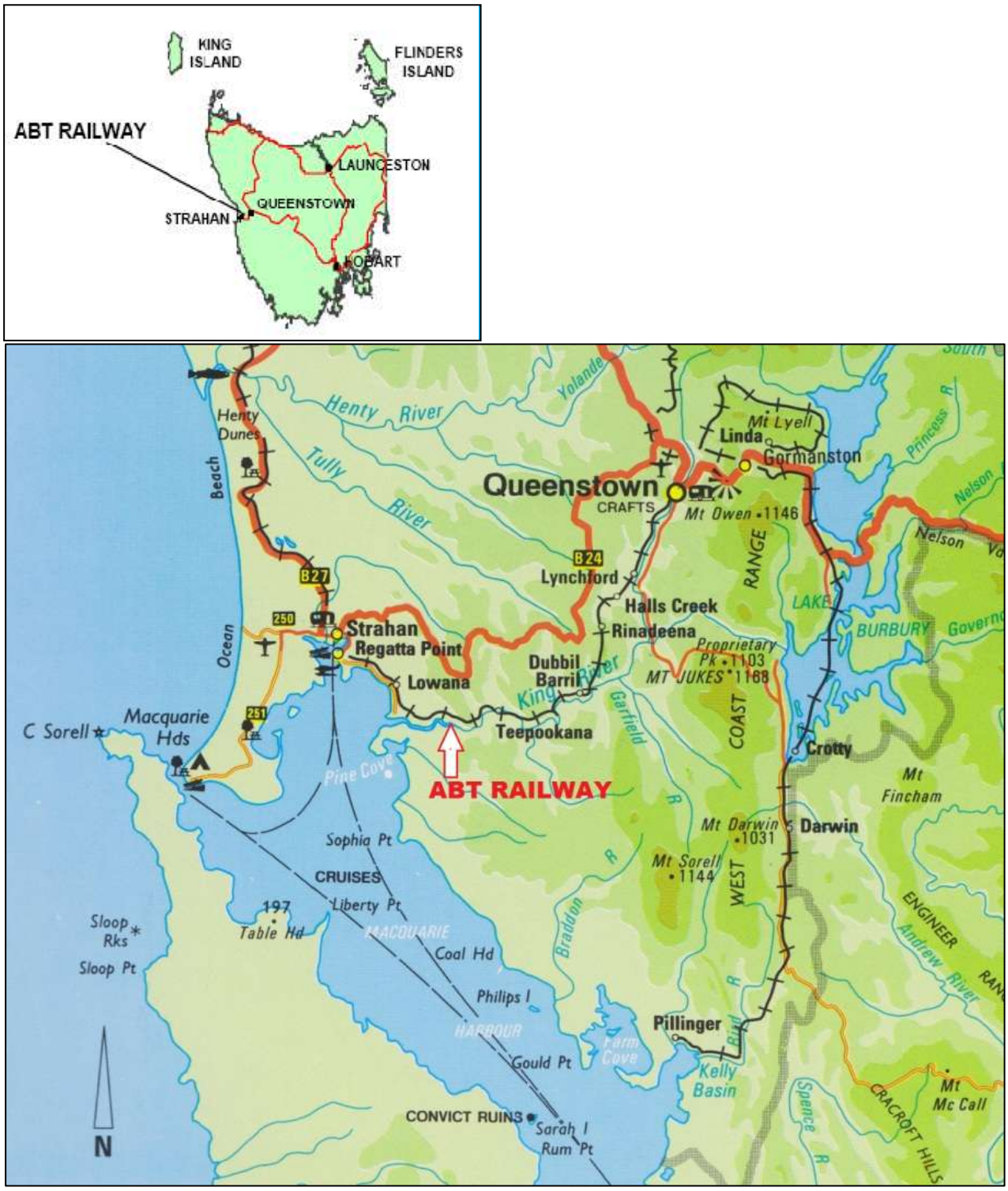


Figure 1 – Location map of West Coast region showing early railways (Cooper)

# OUTLINE HISTORY of WEST COAST MINING, MT LYELL and the RAILWAY

## Depression Years and the search for gold

By the end of the 1840s Tasmania had experienced a fairly rapid growth in population since white settlement in 1803, with the majority being convicts and government officials and less than 20% free settlers.[1] However, by the early 1850s the population increase had slumped due mainly to two factors, the cessation of transportation in 1853 and the exiting of the first generation of Tasmanian-born males to the newly discovered goldfields in Victoria (1851) and in New Zealand (1852).

With the population stagnation and a decline in demand for the goods from a predominantly rural economy, Tasmania was in a recession. The local business community was so alarmed that they petitioned the government to send out parties to search for gold in the western region, following the prediction by William Braithwaite Clarke, a Sydney-based clergyman and respected amateur geologist that gold would be found along the 146$^{o}$ east longitude[2]. In 1858, the Tasmanian Government invited Clarke to become the Colony's first Geological Surveyor but he declined and suggested they consult Sir Roderick Murchison (1792-1871), the famous English geologist. Murchison selected Charles Gould (1834-1893), a young geologist who had already established some eminence in his chosen field.

Gould left for Tasmania in April 1859, arriving firstly in Melbourne, where he met with the Victorian Government Geologist, Mr Selwyn, and then onto Launceston on the steamer 'Black Swan' arriving on 11 July 1859. While many looked upon Gould as the saviour of Tasmania, there were others, particularly some experienced prospectors and bushmen, who thought the newcomer as too young and inexperienced to tackle the rigours of Tasmania's West Coast environment. One gentleman was reported as saying

> "his theoretical knowledge was not worth a straw in Tasmania or Victoria, and it was a well-authenticated fact amongst scientific men that theoretical knowledge with respect to these colonies was altogether valueless, when put in competition, …, with the experience of the pick and shovel"[3]

A prudent Gould did include a number of experienced prospectors and hardened bushmen in his three extensive surveys of the West Coast region. His first expedition party of 22 men left Hobart for Lake St. Clair, the start of the expedition, with Surveyor Gordon Burgess, who had fought his way through to the Eldon Range and the King River six years earlier. This expedition failed to find gold or any other valuable minerals. On a return visit in the summer of 1861-62, Gould's party camped in the "Vale of Chamouni" (later to be named "Linda Valley"), close to the yet to be discovered rich ironstone outcrop that became known as the "Iron Blow". Despite some twelve days surveying the Mt. Lyell area he found only small quantities of gold, his reports giving little optimism for the government of the day. His surveys did however cover much of the colony and added greatly to geographical knowledge of western Tasmania. He named peaks and other sites along the West Coast after contemporary English scientists, including Murchison[4].

The first mineral discovery of any significance in Tasmania was that of tin at Mt. Bischoff in 1871 by James 'Philosopher' Smith, a firm believer of William Clarke's theories. This tin deposit turned out to be the World's richest and at the base of the mountain, Waratah became Tasmania's first mining boom town. Then started a new epoch of prospecting on the West Coast with Waratah now the starting point for prospecting expeditions. Two expeditions by Government Surveyor, Charles Sprent, in 1876 made discoveries of gold, copper, tin, iron ore, and osmiridium. The most notable fields that followed were tin in the Mt. Heemskirk area, some gold around the Pieman River and silver/lead deposits in the Zeehan area.

Mt. Lyell entered the public eye in 1881 when Cornelius Lynch discovered gold in a small tributary (which became known as Lynch's Creek) of the Queen River five miles southwest of Mt. Lyell and a claim was pegged before Lynch returned to Hobart with news of the discovery. By early 1883, Lynch's Creek was pegged out and diggers were soon winning gold from the creeks on the western side of Mt.

[1] Australian Bureau of Statistics Feature Article – History of Tasmania's population 1803-2000

[2] Letter from Rev. W. B. Clarke upon The Report of Mr. Tully, *The Courier* 18th May 1859

[3] Nevin in *The Hobart Town Daily Mercury* 16th July 1859

[4] Mt. Murchison, named after Sir Roderick Murchison, is the tallest peak on the West Coast of Tasmania. The other peaks named by Gould were the next three tallest, Sedgwick, Owen and Jules, in honour of three vocal opponents of Charles Darwin who published his controversial book "The Origin of Species" in 1859. Three smaller peaks took the names of Darwin and two of his supporters, Lyell and Huxley.

Lyell. In late 1883, brothers Mick and Bill McDonough together with Steve Karlson trudged up the western face of the saddle between Mts. Lyell and Owen then descended into the Linda Valley where they came across an old camp site, with tent poles still standing, from the Gould's 1862 expedition. The three stumbled upon a rich gold deposit near a huge iron boulder outcrop (the "Iron Blow").

## Birth of Mt. Lyell and the railway (1891-1963)

The Iron Blow was worked as a gold mine for many years but the three original diggers lost control of the mining operation when more miners, Dixon, Crotty and Henry, were admitted to the syndicate and in 1888 the six formed Mt. Lyell Gold Mining Company. The mine was severely hindered by lack of capital, atrocious weather conditions and poor access. To attract extra capital, Crotty approached mining investor, Bowes Kelly, who in 1891, along with colleague, William Orr, bought into the gold mine, realising that there was a fortune in copper being washed down the gold mine's sluice boxes. In early 1892, they formed the Mt. Lyell Mining Company No Liability. Following some internal feuding, Crotty left the Company and later established North Mt. Lyell that for a time was significant rival to Mt. Lyell.

The Mt. Lyell Mining Company engaged Dr Edward D. Peters, a North American metallurgist and recognised world authority on copper smelting, and under his supervision a smelting trial of 100 tons of 7per cent copper ore was conducted at the Argenton smelter a few kilometres south of Zeehan. The transportation of the ore was a significant undertaking using horse teams and wagons for transport from Mt. Lyell to Strahan, a distance of some 50kms over hilly terrain, and then on to the recently completed (1892) Government Strahan to Zeehan railway. The trial produced a few tons of rich matte assaying at 65 per cent copper were then sent to Strahan for on-shipment to Europe. This arduous venture reinforced the need for an improved means of transportation of the Company's product to a port on Macquarie Harbour.

With a view of raising additional capital to build reduction works and a railway from these works to Strahan, the Mt. Lyell Mining Company was liquidated and a new company, The Mt. Lyell Mining & Railway Company Limited (MLM&R), was incorporated on 29 March 1893[5]. The capital raising was successful but after six months the newly raised funds were exhausted. Fortunately, the discovery of a seam of rich silver ore on the Mt. Lyell lease saved the Company and it could continue with its works program.

Survey work for the railway route began in March 1893 and after identifying three routes, finally choosing the shorter King River route, requiring 7km of rack section to negotiate the Rinadeena Saddle, and eventually terminating at Regatta Point Strahan. Construction was in two stages, with work on the first stage from Queenstown to Teepookana[6] commencing in late 1894 and was virtually complete at the end of 1896. The first official train using the Abt locomotive journeyed from Teepookana to Queenstown on 18 March 1897. The second stage, including a steel truss bridge to span the King River at Teepookana, was finished some two years later, with the first train arriving at Regatta Point on 19 October 1899.Twelve months later the Tasmanian Government Railway extension from Strahan Wharf to Regatta Point was completed thus linking Queenstown to Zeehan by rail and eventually rail links on to Burnie, Launceston and later Hobart.

Mt. Lyell's Abt Railway continued its operation for some 67 years, hauling the product of the Queenstown smelters to Regatta Point Wharf, then back-loading coal and coke, stores and equipment and produce to Queenstown, as well as providing passenger services for mine employees who elected to commute, while living in the seaside 'resort' of Strahan. A memorable annual outing was the Mt. Lyell Picnic at West Strahan which included the train ride for the Queenstown-based employees and their families. The train also offered an important lifestyle source for the people of Queenstown who often timed their days to the first and last train whistle of the day.

## The Intervening 'Forgotten' Years (1963-2000)

The Queenstown and West Coast communities bade farewell to the Abt Railway on 29 June 1963, when the Company could no longer justify the high maintenance costs and pending significant infrastructure replacement costs, particularly the aging timber bridges, when alternative road transportation became available and was proving more economical.

[5] *Examiner* 20th March 1893

[6] The *Zeehan and Dundas Herald*, 2 Nov 1894, reported 'Teepookana' as the Aboriginal word for 'the kingfisher' a bird common to the area. Other newspaper articles of the time also referred to 'Tee Poo Kana' or 'T.P.K.'

Following the closure, four of the five locomotives were moved to go on display at various locations with the other being scrapped. The rail formation was stripped of its rail and sleepers and over time was invaded by wilderness vegetation, with the structures and timber bridges falling into disrepair. Some sections of the formation in Queenstown became a useful corridor for the provision of services; water, sewerage and telecommunications, while at the Strahan end, the formation became a road, providing access to farming areas from Regatta Point east to Lowana; the start of the State Forest managed by Forestry Tasmania. Beyond Lowana and the Iron Bridge crossing, the formation continued as an access road to the forest areas and the rich Huon pine resources on the Teepookana Plateau.

Over the decades following the closure, pressure grew from a group of dedicated Westcoasters to have the railway restored as a heritage, tourist railway, featuring the unique rail system and its mining history. After a number of investigations into the feasibility of the railway's restoration, $20.45 million from the Prime Minister's Federation Fund was made available in 1998. Other funding came from the Tasmanian State Government and the private sector. The engineering project was seen to have a strong focus on heritage and environment, and offering significant economic benefits to Tasmania, in particular the depressed West Coast region. State legislation established the Abt Railway Ministerial Corporation (ARMC) to oversee the implementation process and to manage the railway as a Government-owned but privately operated tourist railway.

## Rebirth of the Abt Railway

In early 1999, consulting engineering firm, Sinclair Knight Merz Pty Ltd, under the direction of their Project Engineer, William Lawson, began work on the engineering scoping and planning, environmental impact assessment, the preparation of tender documents and the calling of tenders. The planning process became an exercise in balancing the requirements of up-to-date technical standards, occupational health and safety standards, the newly introduced rail safety legislation, and environmental, historic, cultural and socially significant issues, against the backdrop of tight budget constraints. In additional to the tourism-focused passenger operation between Queenstown and Strahan, the new railway had to provide a freight train service for road vehicle access to Lower Landing and the Teepookana Plateau for the harvesting of the valuable Huon pine timber and Leatherwood honey.

Work began in February 2000, with the principal siteworks contract (Hazell Bros Civil Contracting Pty Ltd) and the locomotive restoration contract (Saunders and Ward Pty Ltd), both awarded to Tasmanian-based firms. The third contract was for that of the Railway Operator, awarded to Honeybank Pty Ltd, a firm owned by entrepreneur, Roger Smith. In addition to the management as the Operator, Smith's contract included the manufacture of eight passenger carriages, the building of railway stations at Queenstown, Rinadeena, Dubbil Barril and Lower Landing, and a maintenance depot in Queenstown.

Full Rail Safety Accreditation, for both the passenger and the freight operation was granted to Abt Wilderness Railway in 2002. Following financial difficulties Honeybank Pty Ltd reassigned the Operator leases to West Coast Wilderness Railway (WCWR), a wholly-owned subsidiary of the family-owned Tasmanian firm, The Federal Group. The restored Abt Railway was officially opened by the Australian Prime Minister, on 3 April 2003.

The Operator had a 20-year lease agreement with the ARMC and paid an annual rental. After operating the railway for over 10 years, WCWR's parent company gave notice in early 2013 that for economic reasons it was no longer able to continue as the Railway Lessee and Operator and closed its operation down on 30 April 2013.

After a short break in service, the now Government-operated railway began a return passenger service from Queenstown to Dubbil Barril in January 2014, while bridge and track maintenance work was being undertaken over the remainder of the track from Dubbil Barril to Regatta Point. Operation over the full 34.5kms from Queenstown to Regatta Point began in 15 December 2014.

# HERITAGE SIGNIFICANT ITEMS

## The Abt rack system and its creator

Figure 2 Dr Abt (Wikipedia)

Dr Carl Roman Abt was born in Bünzen, Switzerland on 16 July 1850 and studied mechanical engineering at the Swiss Federal Institute of Technology in Zurich. In 1872 he joined the Swiss Centralbahn in Olten, working as a design engineer for Nicklaus Riggenbach (founder of the Riggenbach rack system) and then on to the International Company for Mountain Railways in Aarau, Switzerland in 1879. After two years there, he spent four years in Paris and eventually established his own business in Lucerne.

Abt saw limitations in the Riggenbach rack system, as being expensive to manufacture and maintain and having complex switching arrangements. While in Paris, he designed and patented his own rack-railway system in 1882. His system used two or three solid rack blades with vertical off-set teeth centrally located between the outer adhesion rails. This system ensured the pinions on the locomotive driving wheels were constantly engaged with the rack. Abt considered the twin blade version was adequate, less costly to manufacture and easier to maintain. It also offered a system that accommodated points transitions on rack-operated sidings (see Figure 3), allowed the use of smaller track radii and then with an 1886 patent provided a spring-loaded transition that provided a smoother entry for an adhesion to rack/adhesion rail operation. Both these latter items were used on Mt. Lyell's Abt Railway. Abt also developed the self-regulating 'Abt Switch' for funicular railways and led the construction of 72 mountain railways worldwide.

Figure 3 Abt rack switching, Vale de Núria Railway, Spain (Cooper 2014)

The Abt system was first used on the Blankenburg-Tanne narrow-gauge railway in the Harz Mountains of Germany in 1885, with the triple blade version, as a main line hauling 100 tons on a 1in17 grade (5.9%) at 12-15km/h. Its first use in the Southern hemisphere was on the Transandine 1000mm gauge track in South America, again with the triple blade version, with work on this railway commencing in the late 1880s; however this railway was not fully operational until the late 1890s. Initially using steam locomotion, the railway switched to electrification in 1927.

The first use of the twin-blade, 3ft 6in (1067mm) gauge Abt system in Australia was on the Mt Lyell railway in 1896, followed by the Mt Morgan railway in Queensland in 1898. Both railways serviced copper ore deposits and became a necessity for transporting the product to ports for on-transport by ship. The Mt. Lyell railway also became a vital link for passenger transportation for a number of years before road transport options improved.

Figure 4 Rack spring loaded entry on the restored West Coast Wilderness Railway (Cooper 2003)

By 1905 Abt system rack railways had been built in United Kingdom, United States of America, Switzerland, Germany, France, India, England, Spain, Hungary, Syria, South America, Australia, etc.

Dr. Abt maintained a list of the worldwide rack railways from their inception (Middleton UK 1812) and had Mt. Lyell's Abt Railway listed as number 69[7].

He received many honours, including an honorary doctorate (Doctor honoris causa) from the Technical University of Hanover. He died on 1 May 1933 in Lucerne aged 82.

[7] ABT, Dr. Carl Roman (1895) "Lokomotiv Steilbahnen" Chapter XIV page 21-22 table

## Survey and Construction the Mt Lyell Abt Railway

Under the leadership of Mr. F. A. Cutten, a New Zealand engineer engaged by the Company, several teams, started out in early 1893 and eventually identified three suitable routes for the railway, starting at various locations on the Macquarie Harbour as:

- The Tully route of 21¾ miles (34.8kms) and a ruling gradient of 1:33 (3%) starting at West Strahan.
- The Road route of 19¾ miles (31.6kms) and a ruling gradient of 1:13 (7.7%), which followed the cart road from East Strahan.
- The King route of 18¾ miles (30kms), also a 1:13 gradient, predominantly following the King and Queen River valleys, starting at Pine Cove.

Cutten was not perturbed with the steep gradients on the latter two routes, recommending the King route with the use of a rack rail system to negotiate the steep inclines. He favoured the Abt system, with the Fell system already in use on the Rimutaka incline in New Zealand, as a fall-back option.

ENGINEERS IN CHARGE of the parties which surveyed the Mount Lyell Railway. Back row (left to right): Messrs. E. Westgarth, F. A. Cutten (engineer-in-charge), C. B. Nicholls (draftsman). In front: Messrs. H. Single, W. T. Batchelor, and

**Figure 5 Members of the survey team with Cutten middle back row. W.T. Bachelor (middle front) later became an engineer assisting E.D. Driffield (Mercury)**

*The Mercury* Special Correspondent provided the following vivid description of the challenges experienced by the survey team and the work crews with the following construction.[8]

> To convey a realistic idea of the privation, peril, physical exertion and suffering experienced by all connected with these surveys, is hardly possible. Not merely upon occasions, but continuously, in the precipitous gorges of the King and its affluent watercourses (and corresponding lines on the Henty side), the labour of clambering along anything like a set course was next to superhuman. Imagine a broken rockfaced scarp tilted at an angle forbidding lodgment to any loose object not rested on same jagged shelf projection, the jointy strata at surface ready to give way if touched, to go bounding down a thousand feet or so. Then look up and note hundreds of feet of corresponding rock face studded by projecting points and edges; then see the trees, bushes, ferns, moss, and climbers, mostly alive and vigorous, but sustaining much entangled debris. Deep cleft water courses irregularly creasing the rugged tilted wall, with force and tangle-severed or denuded face; the air and water freezing, or colder, your limbs still and sore with yesterday's and many yesterday's bruises and cuts, your clothing soaked by contact with wet scrub and moss, and bitterly pelting hail and rain; hunger troubling and forbearance on strain through the knowledge that there will be no opportunity to satisfy its claims before an hour or two's surveying thus, sometimes hanging to saplings or roots, sometimes slung by a line kept fast by comrades, to a tree above; and another hour's labour of extrication from hence and travel through tracks, where foothold is possible, to camp. The managing of instruments, the obtaining of stores, all the necessities of this work; and the work itself were matters calling for the very best display of man's best qualities of body and spirit to do and endure, through exercise of faithfulness to duty and hope of victory in the end.

The Company engaged the services of a respected Scottish civil engineer with considerable rail and harbour experience, Mr C. Napier Bell[9], to review the route options. Bell endorsed the King route as the most viable option and praised Cutten for his work. He did, however, cite two areas of concern, namely,

- The Macquarie Harbour termination at Pine Cove, favouring Teepookana on the King River as the port for the first stage, thus providing an option for a later extension to Regatta Point at West Strahan and its possible linking with the Government Strahan to Zeehan railway.
- The more controversial issue was the economics of routing the railway over the dividing range with the rack system or a route through the King River gorge with its easier gradients.

In the end the directors endorsed Cutten's plan with the rack section but adopting Bell's favoured first stage terminal at Teepookana.

[8] *The Mercury* 14th February 1896

[9] Charles Napier Bell (1835-1906) was born in Scotland but spent his later years in New Zealand (1871) working on various port, drainage and railway projects. He then worked in Tasmania and New South Wales on similar projects, dying at Derby, Tasmania.

The initial contract was for the construction of the section between Teepookana and the base of the proposed 1 in 20 Abt incline, a distance of some 4 miles and 32 chains (7kms), was awarded to a Melbourne firm, Garnsworthy and Smith, and work began on 10 December 1894. This section of the line proved extremely troublesome for the contractor and the workers. A number of the workers were Victorian imports, ill-equipped and poorly prepared for the harsh environment (cold and wet climate, tortuous terrain and the impenetrable vegetation) and demanding working conditions (low wages, 10-hour days and 6-day working weeks). A labourer of the time had to purchase his own clothing and provisions from merchants based at Teepookana or the township of Strahan, facing grossly elevated prices. Morale amongst the labour was low and progress for the contractor was slow.

A fair assessment of the terrain is gained from the number of 19 bridges needed over this section including the "Quarter Mile Bridge" over the King River. Construction of this bridge was slow with the driving of the wooden piles through silt of up 60 feet (18m) requiring splicing of the piles before a satisfactory foundation could be achieved. This bridge continued to plague the Mt Lyell Company throughout its useful life, requiring constant maintenance.

The *Mercury* Correspondent provided the following description of the bridge construction.[10]

> The sidling bridges carrying the track over the gullies are, as figures show, very numerous, all but 10 of the total 53 on the 14½ miles being of this character. Take one as an example, and call it 80ft. across. With a casual look at the abutments, just notice the piers. The inner leg of the trestle is stepped, just like a ship's mast, into step block solidly concreted in a hole out from the solid rock. It is 12ft. or 15ft. long. The outer leg of this pier is founded similarly but is 40ft. long. The second pier may have legs 8ft and 35ft. long respectively, or 9ft. and 50ft., just as the indentation in the sideling requires. With this presented to the mind, it will be easy to comprehend how steep a slope the track is built along, and that in the King Gorge there are places where a pebble thrown from the parapet will fall into the river two or three hundred feet below. And it will also be understood that no two bridges are alike in size or height, measured from below. The King Bridge, 1¾ mile from T.P.K. [Teepookana], is a well-designed and executed piece of engineering, and as a timber bridge, compares creditably with any railway bridge in the colony. Somewhat like the one crossing the Mersey at Latrobe this is continued by trestle approaches, the whole work having an extent of 800ft. The bridge proper has two truss spans of 85ft. each, carrying the track 40ft. above the river at ordinary level. Its centre pier is founded in concrete, and the others are built on pile foundations, driven 50ft. in some instances. The approaches are of the usual pattern of pile trestles.

The Company became dissatisfied with the situation and appointed Edward Carus Driffield as Railway Engineer to oversee the whole project and hopefully accelerate the works. Driffield was a South Australian born engineer who had been engaged to supervise the construction of the short section of railway from the Queenstown station site to the Mt Lyell reduction works. He also had previous experience in railway construction on the Mainland. He employed day labour to construct the section from Dubbil Barril to Lynchford which included the rack section. Individual work crews were based in camps spread out along the route. This method of simultaneous construction accelerated the work and the overall project ahead of schedule.

**Figure 6 EC Driffield with WT Batchelor c1896 (Archives of Tasmania)**

Again from our *Mercury* correspondent:

> Mr. Driffield's headquarters are at Camp Spur, 2½ miles from T.P.K, on one of the very few levels in the vicinity. The offices, dwellings, store, machine sheds, and plant for adzing sleepers and bending rails to suit curves are at this point, as also are a smith's shop and sundry railway institutions, including a grand water service brought from a neighbouring hill stream in sizeable piping. The establishment is creditable and complete for its purposes. It has a nice situation on a hill terrace, 100ft, or so above the swiftly flowing river.
>
> ...the work under Mr. Driffield, since November [1895], is shown in 2¾ miles of earthwork, inclusive of a mile of line, being practically completed (rails temporarily laid for immediate traffic necessities, merely requiring to be changed for the permanent ones on arrival), bridges progressing as rapidly as possible, and other earthworks along the line going forward at a rate to see the end of them in six or seven weeks with decent weather. Though technically called earthworks, a great proportion is rock cutting, over seven tons of explosives having to date been expended. Measurements show more than 100,000 cubic yards have been shifted. At Rinadeena, the divide between King and Queen Rivers, 7¼ miles from T.P.K., there is an extensive cutting 40ft. deep, involving excavation and shifting of 25,000 cubic yards. A deeper one beyond is 67ft. deep with 27,000 yards of excavation. Here, Rinadeena, on the level top, there will be a loop when trains will pass each other. Throughout this section of railway there are

[10] *The Mercury* 14th February 1896

48 bridges and culverts too tedious to count, some of these 120ft. to 140ft. long, mostly built of Macquarie pine[11] logs. Six girder bridges crossing the Queen River are on piles of the same lasting timber.


Figure 7 Camp Spur work area showing test rail c1896 (Archives of Tasmania)

Figure 8 Quarter Mile Bridge c1896 (Archives of Tasmania)

In conjunction with the two sections, Teepookana to Dubbil Barril and Dubbil Barril to Lynchford, the Strahan firm of Gaffney and Harvey were building the final link between Lynchford and Queenstown. All earthworks and bridges were completed by 20 May 1896, ready for ballasting and track laying. The first train to steam into Queenstown on 18 July 1896 was hauled by a Hudswell Clarke locomotive, one of the locomotives purchased by the Company to assist the construction, and greeted by a large crowd of local residents.

At this stage the rack rail was not included, waiting for trialling of the first Abt locomotive being assembled at Camp Spur where a small section of the twin-blade centrally-located rack rail was laid. If the Abt system trial was unsuccessful there was always the fall-back solution of the Fell system. The first Abt locomotive arrived from Glasgow on 27 August 1896 and the Company reported on 26 September 1896 that the trial over a test track was very satisfactory with the running being smooth and steady. With fears about the Abt system allayed, the rack was installed over the two inclines and completed by 19 November, 1896.

The full 14½ miles (23.2kms) of track, from Teepookana to Queenstown, was duly inspected by the Tasmanian Government representatives and deemed to be in accordance with the "Mt Lyell and Strahan Railway Act". The Minister for Railways declared the line open and regular train services commenced on 21 December, 1896. An official opening was held on 18 March 1897, with the official train being hauled from Teepookana to Queenstown by locomotive Abt No. 1 carrying a shield with the motto "LABOR OMINA VINCIT", which was taken by the Company to mean "we find a way or make it"[12].

Construction of the extension started at Regatta Point, again under the supervision of E.C. Driffield, in December 1898. This section of 7½ miles (12kms) proved significantly easier than the earlier work but still required eleven bridges and extensive blasting of sheer rock faces that fell away to the King River, to achieve a satisfactory curvilinear alignment. Working east the construction finally met up with the steel truss bridge crossing the King River at Teepookana. The first train over this section ran on 19 October, 1899. The official opening was on the 1 November, 1899 and this time the passenger train ran from Queenstown to Regatta Point and again carrying the now famous shield with its motto.

The railway operated continuously for 67 years but with cheaper transport alternatives and high maintenance costs, particularly with the aging bridge stock, the railway closed in 1963.

## Restoration of the Railway infrastructure

Over the decades following the closure, there were various investigations into the feasibility of the re-establishment of the Abt Railway until the lifeline of Federal Government funding saw the restoration of the railway becoming a reality. From the outset, it was accepted that the project would be working within

[11] Macquarie pine was the early name of what became known as the famous Huon pine.

[12] The true translation from Latin to English is "Labour Conquers All" or "Work Conquers All"

severe budget constraints, so innovation in methodology and use of materials was needed if the dream was to be fulfilled. A primary objective was to achieve economy in the use of resources, with the greatest being the retention of the original route as most of the original formation was still intact and sound. Further economies were achieved with the re-use of materials including, rail, Bailey Bridging, refurbishing Iron Bridge, recycling girders from the old Henty River railway bridge for Queen River Bridge, original bridge footings and the existing Huon pine culverts. The Government supplied 27kms of second-hand rail recovered from a closed Tasmania rail line. The remainder of the rail was to be sourced by the contractor as well as the supply of all rail jewellery. This sourcing of the rail ended up with some eight slightly differing rail types of 60lb and 63lb rail, which created problems with the rail installation for the contractor and on-going maintenance for the rail operator.

During the preparation of their successful confirming tender, the contractor recognised that a "fit for purpose" approach was needed to meet the financial constraints. After negotiation, an alternative tender, which maximised the use of second-hand materials whilst still providing a safe outcome and a responsible approach to maintenance levels, was accepted. The extensive use second-hand timber sleepers, fishplates, baseplates and other rail jewellery, demanded significant application of professional skill and experience in their assessment in the track design, construction and eventual development of appropriate maintenance management regimes. When disagreement arose regarding the technical standards to be applied in a "fit for purpose" scenario, a workshop which included the Superintendent, Principal, Operator, Contractor and his track laying subcontractor, rail designers and rail industry experts was convened to work through the key issues, and develop appropriate standards. With safety of the railway a prime concern, the workshop identified critical areas where the specified standards could not be met without the possibility of considerable delay and expense. Special measures were agreed to address these critical areas. One example related to sections of tight curvature, where the agreed action was to weld the high rail, install checkrails and gauge bars, thus adding extra safety against a risk of derailment.

The environment through which the railway travels reflects its century-long history of human intervention and impact, from the orange-coloured mines tailings that border the King River to the remnant Rhododendron and Fuchsia plantations at the fettler cottage locations dotted along the route. The preservation of cultural and heritage aspects of the railway became a key focus of the environmental assessment and restoration process. Adherence to the original route location, minimal impact on the railway cuttings, the restoration of the few remaining structures and the design and construction of the replacement bridges were singled out for specific attention to reflect the heritage significance of the rail infrastructure. The majority of the original timber trestle bridges were replaced with steel trestle bridges positioned on the original bridge foundations, with four bridges being constructed with replica squared timber trestles, corbels and girders.

Figure 9 Timber replica bridge under construction with part of old bridge lower left c2000 (Cooper)

Figure 10 Steel trestle bridge c2001 (Cooper)

The steel trestle design allowed for prior assembly of differing bridge trestle heights with measurements taken for each bridge pier and the individual units transported to the site ready for placement on the prepared concrete footings.

## Abt locomotives and the railway operation

The railway operated a fleet of five 0-4-2 rack/adhesion locomotives, the first four built by Dübs and Co. of Glasgow and the fifth by North British Locomotive Co. Ltd. which absorbed Dübs and Co. in 1903. Locomotive names, builder's number and year of manufacture are shown in the accompanying table.

Each locomotive had two sets of cylinders, one for the adhesion drive and the other for the rack drive. The rack system was supported on the two leading axles. The adhesion drive alone operated over the non-rack sections but both rack and adhesion drives were in operation on the rack inclines. The initial 5m of rack rail was fitted with a special spring-loaded entry which eased the rack pinion engagement with the rack rail. As the locomotives were operating on generally constant gradients, once the correct pressure balance was obtained between the two drive systems there was little need for further adjustment. The Walschaerts valve gear was used on both the adhesion and the rack drives on all of the Abt locomotives.

The boiler design was of a conventional locomotive type except for the gauge glasses used for determining boiler water level that were located midway down the boiler barrel. This was done to allow for a more accurate reading to be made when going up or down the steep inclines.

There were four different braking systems fitted; the automatic vacuum brakes that acted on the hauled rolling stock as well as the locomotives, the friction brake on the locomotive when stopped and the rolling stock if stationary for an extended time, the counter pressure brake (Riggenbach system) that works on both the rack and adhesion cylinders and limits the amount of steam that can escape on downhill running, and a manual brake that worked on the rack pinion brake drums. This latter brake system was rarely used and was not included in the 2000 and later restoration contract works.

No two of the Abt locomotives used by the Company were identical, or ordered at the same time. Based on information gathered by the maintenance personnel, suggested improvements and minor design changes were fed back to the locomotive manufacturer. The only major change was with Abt No. 1 in which the original side-located coal bunkers were replaced with two water tanks and a single coal bunker at the rear of the cabin. This change mirrored the coal and water tank arrangement for the later model locos. The locomotives underwent a modernisation in the 1950s with the addition of steam turbo-generators to provide electric lighting and fuel-oil firing replacing coal. The oil firing equipment was supplied by a South Australian company. The initial use of heavy oil required heating elements but when diesel oil was tried and found to burn satisfactorily, the heating elements were no longer required.

The ore transport operation was originally shared between the Abt locomotives and Baldwin 0-6-0 tank locomotives, with the combination of locomotives varying significantly with the weather conditions. For example, the Baldwin could haul 35 tons over the 1 in 16 grade (6.25%) in dry conditions but much less in the rain. The trains were banked by a second locomotive usually stationed at Hall's Creek waiting for the train to pass then catching up to the train to assist in the push up the climb to Rinadeena. On reaching the top of the climb the banking locomotive would drop away and back down to Hall's Creek.

The railway was seen as 'cutting-edge' technology for its day and much effort was spent by the Company's Railway Department in assessing the performance of each individual locomotive (Abt and adhesion) and the railway as a whole in relation to its contemporaries, in particular other Australian railways. The assessments included Engine Mileage, freight type and tonnage hauled.

| Road name | Builder No. | Build Year |
|---|---|---|
| Abt1 | 3369 | 1896 |
| Abt2 | 3594 | 1898 |
| Abt3 | 3730 | 1898 |
| Abt4 | 4085 | 1901 |
| Abt5 | 24418 | 1938 |

By the 1950s the railway's capacity was taxed to the limit, mainly due to the restriction of the 60 ton limit per Abt locomotive on the Hall's Creek to Rinadeena climb. The Abt locomotives were freed up to concentrate on the rack inclines with the company purchasing two DS class locomotives from Tasmanian Government Railways and these were later superseded by two Vulcan Drewry diesel shunting locomotives. The diesel units were able to haul heavier loads and concentrate on the Dubbil Barril to Regatta Point section. All five Abt locomotives, along with the Drewry locomotives, remained in operation up till the railway closure in 1963.

## Restoration of the Abt and diesel locomotives

The restoration of three Abt locomotives, initially Abt No. 1 and Abt No. 3 and then later Abt No. 5, had to comply with strict criteria to ensure they were as close as possible to genuine replicas of the originals;

in particular the visible exterior of all parts of the locomotive as they were presented at the time of closure.[13] The working load performance also had to meet those of the original locomotives, i.e. 110 tons under adhesion, 60 tons on the 1:16 rack section and 75 tons on the 1:20 rack section. Pre-tender inspections revealed that new boilers were required, along with new water tanks, considerable refurbishment of the locomotive frames. Both pairs of cylinders (adhesion drive and rack drive) were not only out-of-round but also badly tapered with no two cylinders the same size. These were bored to the barest common diameter of 300 mm. The original rack pinions had excessive tooth wear and were replaced with new pinions from steel sheet and a new involute gear profile, as it was difficult to define the exact tooth profile from the Mt Lyell drawings. The boiler was designed by Chief Mechanical Engineer of Ffestiniog Railway to meet Australian Standard AS 1228-1997. The boiler design brief was that the boiler total length, tube and firebox heating surface areas of the new boiler were to match the original. The difference with the new boilers was that they had all square corners (there being no flanged plates). Another new feature was a central steam supply manifold; the original units having several take-off points.

Over the last decade of operation West Coast Wilderness Railway's engineering team has investigated ways of improving the efficiency of the Abt locomotives. The Abt locomotives are popular with the railway's patrons but have a very high fuel consumption rate, over 15 times that of the mechanical diesel locomotives. A change to recycled light oil, supplied by a Tasmanian firm, showed 25% reduction in the fuel costs over standard diesel fuel, with no apparent loss in operational efficiency or adverse environmental impacts. Further efficiency gains were achieved with the installation of a Lempor exhaust ejector system designed to fit within the existing chimney, with fuel consumption savings of some 30%.

## Iron Bridge at Teepookana

The Teepookana landing on the eastern side of the King River could accommodate the unloading of equipment and materials and already had a large work area ideal for the assembly and launching of the bridge to cross the river. Preparatory work on the abutments began in early June 1899 with excavation of rock on the western (or Strahan) abutment to establish a solid rock base with a concrete capping. The eastern side required pile foundations for the abutment and two timber trestle piers, with the larger of the two supporting the eastern end of the main bridge superstructure. [14]

The steel Pratt truss bridge for the main span, 142ft (43.28m) long, 18ft (5.49m) deep and 15½ft (4.42) wide, was designed and manufactured by the London-based firm Joseph Westwood and Co. The sections, comprising the truss panels, cross members and bracing, were shipped to Tasmania, arriving at Strahan in early August. The cargo was then loaded on to barges for transport up the King River to Teepookana were work began on the assembly and riveting of the truss.

The launching of the completed 100 tonne (110 ton) truss in late September was accomplished by hauling the whole structure with the use of cables anchored on the western side, firstly from the land on the eastern side, then over the two steel girder spans and on to a trestle structure setup on a barge. On arrival at the Strahan side of the river, the truss was positioned over the abutment and lowered by weighting the barge with sand bags until the truss was satisfactorily seated on the bearings. A newspaper reporter present at the launching wrote[15]

"King River steel bridge successfully launched without slightest hitch".

The two photographs below (Figures 11 & 12) show the progressive launching operation viewed from downstream, with the third photograph (Figure 13) also from downstream shortly after completion showing the Teepookana work area.

[13] A Tasmanian Heritage Council (THC) requirement for the locomotives was that where brass can be seen, brass has to go back and the era or look of the locomotives should be as they were when they ceased operation in 1963. The THC did give approval for a steam manifold to be fitted to the boilers.

[14] The author has not, as yet, been able to ascertain why the truss section was significantly shorter than required and why the two approach girder spans were necessary for the overall structure.

[15] *The Mercury* 17th October 1899.

Figure 11 Launching of Iron Bridge from Teepookana yard viewed from D/S (Archives of Tasmania)

Figure 12 Launching of Iron Bridge with winching cables visible on the truss and barge (Archives of Tasmania)

Figure 13 Iron Bridge from D/S with view of Teepookana yard (Archives of Tasmania ex Spurling Collection)

## Renovation of Iron Bridge

Post 1963 and the removal of the rail track, Iron Bridge became a useful and only crossing for road vehicles for forestry and honey harvesting operations, along with 4WDs, motor cycles, bushwalkers and even horse riding ventures.

However, by 1999 the condition and particularly the load-bearing capacity of the structure had seriously deteriorated. Some of the original members had corroded so badly that they were 'see-through', and safety nets were hung to protect bridge users from falling debris. Many of the upper level cross trusses, bracing, flanges and web sections required replacement or strengthening to meet the required loading capacity. Although the cross trusses could have been replaced with UB beams every effort was made to fabricate similar trusses to the originals. Fortunately, metallurgical tests revealed that the original steel was weldable and close to current grade of AS3678-250, making it possible to weld strengthening plate to the existing corrosion-damaged webs, attach new bracing and the replica top truss cross members without the need for bolting. The original timber piles that supported the eastern end of the truss bridge were trimmed below low water and a new concrete pile cap was constructed while the bridge was temporally jacked up on its outer-most piles. These piles were incorporated into the pile cap after the bridge was lowered onto the new pile cap and columns.

The load-carrying capacity and the vertical and horizontal clearances of Iron Bridge became a limiting factor for all train combinations of passenger carriages and in particular the freight movements. Figure 14 shows the very tight clearances and also the new upper cross truss, with Figures 15 and 16 showing the trains for Huon pine transport and Leatherwood honey bee transport.

Figure 14 Iron Bridge clearance trial for proposed freight wagon. c2001 (Cooper)

Figure 15 Loaded trucks on wagons checking clearance through yellow clearance frame and restored Drewry locomotive (Cooper)

Figure 16 1 million passengers (bees) on their way to Teepookana Plateau

## FURTHER ITEMS OF INTEREST

The items listed below are not necessary of engineering heritage value but some are important in that they form an important part in aspects of the railway and needed special attention, some of which were included as part of the Tasmanian Heritage Council's specifications for the restoration project.

- The Abt locomotives used the Walschaerts valve arrangement patented by Belgian, Egide Walschaerts in 1844 and an improved patent in 1848.
- Construction of this railway using predominately hand (pick-and-shovel) labour in the extremely harsh terrain and environmental conditions was a significant engineering achievement, particularly the Stage 1 work which was completed in 19 months. The restoration project demanded minimal interference to the original railway corridor and there are many examples along the track of the cuttings and rock-wall structures that are as they were when first built.
- Many of the original Huon pine drainage culverts are still in place and operational. The restoration project specifications allowed the Principal Siteworks contractor to review the drainage efficacy and if still free-draining, to leave culverts intact.
- Timber trestle bridges were constructed of squared timber, instead of the round timbers commonly-used for stringers and corbels on timber bridges. Stepped footings were used to fit the terrain, somewhat unique for timber bridge construction at the time. Mt. Lyell had some 2000 timber workers felling and shaping the timbers for a range of uses, such as mine props and support beams, railway sleepers and building construction, so it is not surprising that they would also use squared timbers for the bridges.
- The original turntable at Dubbil Barril is in place and operational. The two turntables operating at the Queenstown and Regatta Point stations were recovered from other Tasmanian railways and refurbished prior to installation.
- The main structure of Regatta Point Station has remained virtually intact and is historically significant as an example of the standard station building designs employed in other narrow gauge railways in the early part of the 20th Century.
- The original Regatta Point Locomotive Shed has been restored and is in use today. This was not part of the restoration project but was a jointly funded project by the Abt Railway Ministerial Corporation and the Operator in 2004.

Figure 17 Regatta Point c1930 showing Loco Shed on left and Station (Archives of Tasmania)

Figure 18 Restored Loco Shed and rejuvenated Station on the right c2005 (Cooper)

- Various items of the Mt Lyell Railway rolling stock are still in use or visible, including a restored Abt Railway Guards Van.
- Three Drewry Diesel locomotives have been restored and are used for shunting, running the passenger service from Dubbil Barril and the Huon pine and honey bee freight operation between Lowana Siding and the Lower Landing Siding at the base of the Teepookana Plateau. Locomotives D1 and D2 were Abt Railway originals and the third was V9 which was the first Drewry diesel assembled in the Tasmanian Government Railways workshops in Launceston.

# HERITAGE ASSESSMENT

## Historical significance

The advent of the Tasmania's West Coast mining boom over the latter part of the 19th Century was a saviour to the lagging economy of the State and a stimulus to the population growth of the West Coast region. The enduring legacy of the Mount Lyell Mining and Railway Company for over a century saw generations of families growing up and working in the mine or on the Railway. The Westcoasters grew up to be proud of their heritage and their culture. Many went on to be doctors, lawyers, engineers and even politicians, many maintaining a strong cultural connection with the West Coast.

The strong desire by some dedicated locals to see the Abt Railway return as a tourist railway of national and international significance that never waned, eventually bore fruit with funding from The Centenary of Federation Fund being made available for its restoration.

## Historical individuals and associations

Bowes Kelly

**Anthony Edwin Bowes Kelly (1852-1930)** was born in Galway, Ireland. Two years later his family migrated to New South Wales. Bowes Kelly made his fortune by buying a one-fourteenth of a share in Broken Hill. He went on to be Chairman of the Board before moving to Tasmania. He stayed as a member of the BHP Board and returned to become Chairman from 1917 to 1922.

His second fortune was based on the Mt. Lyell copper mine, firstly becoming the principal shareholder in the Mt Lyell Mining Co. N. L. and then reforming the Company to Mt. Lyell Mining and Railway Co. Ltd in 1893. As Chairman of the Board he guided the Company and the Railway to prominence. Kelly had a strong interest in the welfare of his employees and the local community, a notable inclusion being the special annual picnic trains that carried employees and their families from Queenstown to picnic at West Strahan.

R C Sticht

**Robert Carl Sticht (1856-1922)**, metallurgist and mining engineer, was born in Hoboken, New Jersey, United States of America, son of German-American parents from Brooklyn. In 1893 he was approached by William Knox and William Orr, directors of the newly formed Mount Lyell Mining & Railway Co. Ltd, who offered him the position of metallurgist at the new Queenstown mine, Tasmania. Sticht arrived at Queenstown in 1895 with his wife of six months, Marion Oak, née Staige, from Illinois; he was to become a dominant figure in Tasmanian industry and in the West Coast community.

His first task was to persuade the company principals to abandon their plans of roasting the Mount Lyell ore and smelting it in a blast furnace in favour of the more efficient but fickle process of pyritic smelting, whereby the sulphur content in the copper ore can be smelted without the use of introduced fuel. Sticht directed the construction of a reduction works, partly his own design, and the first two furnaces were fired in 1896. Some five years later he attained the first truly successful pyritic smelting result, gaining the reputation as the greatest authority on pyritic smelting process.

Appointed General Manager in 1897, he was not a desk-bound administrator, but spent much of his time on the works' floor and set about making the remote west-coast mine as self-sufficient as possible.

Sticht passed away in St. Margaret's Hospital, Launceston in May 1922. The mineral stichtite commemorates his name.

**F. A. Cutten,** a New Zealand engineer, was appointed to oversee the survey work to identify the best route of Mt. Lyell's railway line. Eventually the King River route was chosen and it was Cutten who suggested the Abt system to meet the challenge of the inclines over the Rinadeena Saddle. Cutten, no doubt was familiar with the Fell rack system that had been used in New Zealand. Cutten went on to be Engineer-in-Chief for the Company.

**Edward Carus Driffield AMICE (1865-1945)** was born in South Australia. He moved to Queenstown 1894 to take up a position overseeing the construction of the short stretch of rail from the Queenstown Station to the Mt Lyell reduction works. Driffield had experience with two previous railway construction projects on the Mainland. He was appointed as Railway Engineer and succeeded in speeding up the

railway construction using day labour resources so that it came in on schedule. He remained with Mt. Lyell for 30 years holding the position of Superintending Engineer of Railways. He retired in 1923 due to ill health but continued as a consulting engineer to the Company.


**E C Driffield**

He met and married Katherine Wroe of Colebrook in 1903 and they settled in Queenstown and became well respected and active couple in community and regional affairs. At a Citizens' Farwell Dinner, The Hon, Andrew Lawson MLC, gave a eulogistic address to Mr. and Mrs. Driffield, praising firstly Driffield for his township in laying out thoroughfares and sewerage and water systems and Mrs Driffield for her charity and community work.[16]

**Roger Smith**, a Launceston entrepreneur and a keen railway enthusiast had over the years spent much time, money and effort to have the railway restored. Following a rigorous tender process, Smith's company, Abt Railway Holdings Pty Ltd, was awarded the lease as Operator of the Railway. In addition to the running of the railway, Smith was responsible for the design and construction of eight carriages, the Queenstown Station and the maintenance depot. Smith provided replica buildings and carriages, fitted out using local timbers, and these remain as an enduring symbol of his dedication. Due to financial difficulties Smith had to reassign his operating leases in 2002.


**R Smith**

**William Lawson AM FIEAust CPEng titled**, a Principal of Sinclair Knight Merz (SKM) consulting engineers became Project Manager for the Abt Railway Restoration Project when SKM was awarded the contract for the engineering scoping and planning, environmental impact assessment and the preparation of tender documents. Lawson, a Queenstown boy with a long West Coast heritage, had a personal as well as a professional interest in the success of the project.


**W Lawson**

**Greg Farrell**, as Managing Director of The Federal Group, and a strong interest in steam locomotion, arranged for a subsidiary company, West Coast Wilderness Railway, to assume control as Operator in August 2002. The railway then became part of the Company's tourism-focussed Strahan Village complex.

**Mt. Lyell Mining and Railway Company** was the generator of significant economic development for Queenstown and its environs and spawning generations of families working directly for or associated with the Company from a strong cultural heritage developed.

**The Federal Group and West Coast Wilderness Railway** (WCWR) operated the railway from August 2002 until their exit in April 2013, citing non-commercial viability of their operation, mainly due to the State's significant drop in tourism numbers. Over the ten years the parent company and WCWR developed a valuable tourist focussed asset for the State. WCWR sort expertise and made changes to the Abt locomotives that made significant improvements to the economy of their operation.

**The Abt Railway Ministerial Corporation (The Tasmanian Minister for Infrastructure)** is the owner of the railway and is now also operating the railway pending the sourcing of a suitable Operator.

## Creative and technical achievement

The decision by Cutten to propose the King Route along with the Abt system and for the Company to accept it was a highly creative, if not speculative venture, with the technology only 10 years in the making. The Abt system is still considered the most technically advanced rack system in the up to 25% incline range.

The design and manufacture of the Abt locomotives by Dübs & Co. and the reassembly and successful commissioning by the Mt Lyell engineers and mechanical tradesmen, particularly with Abt No. 1, was a significant engineering achievement.

The decision by Cutten to set up the work and testing area at Camp Spur on the King River at the base of the incline showed creative thinking and sound technical execution.

[16] *Advocate* 22nd November 1923.

Driffield's decision to choose day labour and the stationing of work crew units in camps along the most challenging stages of the Railway, particularly the inclined sections, significantly sped up the first stage construction, bringing the whole of this part of the project to completion inside 19 months; a significant engineering achievement considering the challenges of remoteness, extreme weather and terrain conditions, manpower management and logistics of materials and equipment supply.

## Research potential

The decision of Cutten to choose the Abt system, in particularly how he became aware of its existence and capability and how Dübs & Co. came to be involved, requires further investigation.

Dr. Abt contributed an article on a survey of rack railways to "Lokomotiv Steilbahnen" c1895 and further research into this and similar publications of that time would help in an engineering and community historic context.

Further investigation of the specifications for the Iron Bridge, the engagement of the London manufacturer, and how the structural elements were tested, packaged and delivered to Tasmania would be useful in the history of this bridge. It is unclear why the truss unit delivered was some 15 metres short of the overall span.

## Social benefits

The railway has had strong social connections and provided economic benefits for the West Coast community over many generations.

The strong pressure to have the railway restored as a tourist railway is evidenced by the enthusiasm of the community to be part of its recovery and continuing existence.

## Rarity

The Mt Lyell Abt Railway was the longest running steam-driven locomotive railway of its kind in the Southern Hemisphere and its restored West Coast Wilderness Railway is the only currently operating steam-driven Abt railway in the Southern Hemisphere.

The Mt Lyell Abt locomotives were and still are unique locomotives. Improvements made by the Engineering Department of West Coast Wilderness Railway have significantly improved the fuel economy of the operation of these locomotives.

Although possibly not unique, the timber trestle stepped bridges were a rarity, as are the timber and steel bridges used on the restored railway.

The exhaustive restoration process of the planning, heritage, environment and cultural assessment to ensure that the restored Abt Railway was as close as possible representative of the original was a rare achievement, so much so that it was awarded state and national recognition by Engineers Australia.

## Representativeness

An attempt has been made in this submission to outline the uniqueness of the civil engineering challenges faced by the early engineers, labourers and contractors, working in the extreme conditions in such a remote location at the end of the 19$^{th}$ Century.

The work on the Abt Railway restoration project had additional and somewhat different challenges to provide tourism and freight services that meet modern standards while still providing a genuine replica.

The Abt locomotives are unique in being purpose built for the Mt Lyell Railway. The steam-drive systems were similar in other steam locomotives of the time but as detailed in the text there were two sets of cylinders and specific provisions for operation on grades.

## Integrity/Intactness

The changes to the track and the locomotives have been covered extensively in the relevant sections of this submission.

## Statement of Significance

The railway grew out of a need for an effective means of transport of the vast quantities of ore that the Mt Lyell Mining and Railway Company mined from their valuable resource. The challenges were almost insurmountable but the Mt Lyell Abt Railway was built and operated successfully for over 67 years. The town of Queenstown and its environs grew in prosperity and generations of families developed a strong cultural connection with the town and the region.

Not only was the railway vital in transporting ore from Queenstown and goods on return, it was a daily passenger service for commuters choosing to live in the harbour-side town of Strahan and on Sundays the Queenstown residents enjoyed an outing of sport and recreation in Strahan.

The railway in its entirety is unique as the only steam-driven Abt railway still operating in the Southern Hemisphere, and has been successfully restored and is now operating as a tourism-focussed heritage railway.

## Area of Significance

Warrants International recognition.

# INTERPRETATION PLAN

Interpretation Plan Title: TASMANIA'S WEST COAST WILDERNESS (ABT) RAILWAY

## Proposed themes and locations

It is proposed to have interpretation plaques at each of the terminus stations ie Queenstown Station and at Regatta Point Station, Strahan. The plaques will be the same, focussing on the four engineering heritage items and the key early engineers employed by the Mt Lyell Mining & Railway Company P/L. The exact location and content of the plaques will require confirmation with West Coast Wilderness Railway as the owner has a number of interpretation panels at sites along the railway. Although initial discussions have taken place further discussions will be needed to confirm content and location.

Initial suggestions for the Queenstown plaque is outside the Northern entrance door or north of the turntable adjacent to the car park and for the Regatta Point Station at the northern end of the station platform or on the station wall facing the platform.

**Queenstown Station and Regatta Point Station interpretation content**

**Constructing the Mount Lyell Railway**

**Surveying of the railway route options** with a picture of a survey team camp

**Railway route construction** with pictures of; 1. Work crew laying rack rail, 2. Camp Spur base camp, 3. Quarter Mile Bridge, 4. Teepookana port on the King River, 5. Iron Bridge.

**Restoration project**

**Abt locomotives** with picture of restored locomotive on Dubbil Barril turntable.

**Important Engineers**

**Dr Carl Roman Abt** with picture of 1. Abt and 2. rack bars

**Robert Sticht**, picture in his office and library

**F. A. Cutten**

**Edward Driffield**, with picture

**Interpretation panel locations**

**Queenstown**

Both the Owner and Engineering Heritage Tasmania consider a location on the forecourt to the right of the doorway at the northern end of the Station would be the most appropriate.

**Regatta Point**

There are a number of suitable locations for the panel and plaque at Regatta Point but most suitable might on the wall facing the station platform. Currently the wall already has a number of interpretation panels so there will need to be further negotiation with the owner/operator.

# REFERENCES

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## Other referenced sources

Various newspaper articles from *Examiner, The Courier, The Hobart Town Dailey Mercury, The Mercury, The Zeehan and Dundas Herald* – refer to Foot Notes for details

Archives of Tasmania

Australian National University Library